Exhibit 2

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

IN RE: NATIONAL PRESCRIPTION OPIATE LITIGATION	)	MDL No. 2804
	)	Case No. 1:17-MD-2804
THIS DOCUMENT RELATES TO ALL CASES	)	Hon. Dan A. Polster

Saturday, May 4, 2019

HIGHLY CONFIDENTIAL - SUBJECT TO FURTHER CONFIDENTIALITY REVIEW

Videotaped Deposition of MEREDITH B. ROSENTHAL, Ph.D., held at Robins Kaplan LLP, 800 Boylston Street, Suite 2500, Boston, Massachusetts, commencing at 8:04 a.m., on the above date, before Michael E. Miller, Fellow of the Academy of Professional Reporters, Registered Diplomate Reporter, Certified Realtime Reporter and Notary Public.

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again, as a health economist, a question of ascertaining what was in a particular detail, but what was available in -- through key opinion leaders, what was available through professional guidelines, all of that setting the context. So it's not so much about looking for one co-mission as a much broader picture of what the information was that was conveyed.

Q. Okay. You've testified as a causation or damages expert before, correct?

MR. SOBOL: Objection.

A. I have.

BY MR. ROTH:

Q. And in general, you understand that to opine on causation or damages, you have to tie the theory of liability to damages?

MR. SOBOL: Objection.

A. Yes, and I have done that in my report.

BY MR. ROTH:

Q. Okay. The complaint defines a theory of liability here as false and incomplete information, correct?

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A. Yes, correct.

Q. What have you done to confirm that the detailing visits you analyzed actually contained false and incomplete information as the complaint or you define it?

MR. SOBOL: Objection, just asked and answered.

A. As we talked about earlier, I've been asked to assume that counsel will prove that all or virtually all marketing during the period from 1995 to the end of my data was unlawful.

So I have tested the reasonableness of that assumption in the review of the documents that we've talked about, in the review of other expert opinions.

I have not, nor do I believe it's necessary to make that causal step, looked at individual details throughout the period for my analysis.

BY MR. ROTH:

Q. You would agree that detailing in and of itself is not unlawful?

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MR. SOBOL: Objection.

A. Well, again, if that detailing is conveying false and misleading information, I understand -- I'm not a lawyer, but I understand that it would be unlawful. And so, you know, I do not -- I am not making an assumption that detailing in general is unlawful but that this detailing can be proved to be unlawful.

BY MR. ROTH:

Q. A pharmaceutical rep going to a doctor to drop off a pizza could be considered a detailing visit, correct?

MR. SOBOL: Objection.

A. A detailing visit generally involves the conveyance of some information, maybe a pizza in addition, but the details that I'm looking at, there is a specific product mentioned.

BY MR. ROTH:

Q. But detailing visits can take many forms, correct?

MR. SOBOL: Objection.

A. Well, I'm not sure exactly what you mean by it. There's information conveyed

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about a product or a set of products, and detailing visits are face-to-face visits between the salesperson and someone in the physician's office.

BY MR. ROTH:

Q. But you know that detailing could just be the sales rep dropping off a placard with the product's label on it?

MR. SOBOL: Objection.

A. I think you misunderstand, again, the interconnectedness of all of this. And so if a detail were something like you just described -- I don't know about a placard, how about a coffee mug -- those details are intended to reinforce messages that have been conveyed in previous details that have been conveyed by key opinion leaders.

I don't think it's appropriate to pull these individual pieces out as if they were not part of an integrated marketing scheme, which is really precisely what Dr. Perri talks about in his report.

BY MR. ROTH:

Q. But you're not offering the

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BY MR. ROTH:
Q. And --
A. I did look for those data.
Q. You did look for it. And that's true of every single manufacturer defendant, there is no physician-level detailing data available?
MR. SOBOL: Objection.
A. There were no physician-level detailing data for any manufacturer that covered the period of interest. So in order for me to do my analysis, I would need those data for all the defendants for the entire time period.
So where -- to the extent that we found any data, they were bits and pieces of contact registries, essentially sales databases, which are not the same level as what these folks have -- they have actual linked data, linkable.
BY MR. ROTH:
Q. But you didn't take the specific data you had for individual defendants for whatever time period you had to test the results of your regression

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against a model you could do on just that data?
MR. SOBOL: Objection, form and asked and answered.
A. There would be no such test. These -- the goal of my analysis and the goal of Datta and Dave's analysis are completely different. So there -- there would be no point in comparing those results.
They are trying to ascertain the extent to which detailing across physicians drives marketing impact, so they're really interested in questions like, you know, what -- how -- how much does it make sense for a company to detail high prescribers versus low prescribers to a greater degree.
I'm interested in the aggregate impact, and so that is what my model does best. Their model would not be appropriate for ascertaining the aggregate impact.
BY MR. ROTH:
Q. I understand you're interested in the aggregate impact, but if one were interested in the individual impact of any

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single manufacturer's detailing, you could run an analysis similar to Datta and Dave using whatever data were available for that manufacturer?
MR. SOBOL: Objection.
A. There are two levels of aggregation here. One is from the doctors up to the total product level, and the other is from the product to the defendant to the whole class, if I can use that term to describe all the opioids that we're interested in here.
So Datta and Dave are at the most granular level, the individual doctor prescribing for an individual drug.
I am interested in understanding how marketing as a whole drove sales in this market and I want to capture all of the spillover effects. They're trying to tease out other kinds of effects.
This analysis could not be used to get an answer to the question what would have happened if these manufacturers had not marketed their products.
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BY MR. ROTH:
Q. And the reason you're interested in the aggregate question is that was the charge you were given by plaintiffs' counsel was to look at the aggregate impact as opposed to an individual defendant-specific impact?
A. Well, again, there are multiple levels of aggregation here, so if I -- my model, as you know, can be used to parse out individual defendants as I have done in Table 3 of my report, so it can look at an individual defendant, and I've shown you results excluding individual defendants. So it is already doing that.
It's the cross-sectional nature of what they're modeling here with the physician-fixed effects. They're really trying to tease apart how manufacturers go about targeting doctors for marketing and what effect that has.
I'm not interested in that effect, and so it wouldn't be appropriate even if I were only looking for one defendant.

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level; is that right?
MR. SOBOL: Objection.
A. Professor Cutler's calculations, once he has looked at the effect of shipments on harms, he then applies my percentage to that, yes.
BY MR. ROTH:
Q. Did you have any conversations with Professor Cutler about the fact that he was taking your national model and then applying it to his county model and what that might mean for his results?
MR. SOBOL: That's a yes or a no.
A. Yes.
BY MR. ROTH:
Q. Did you have any of those conversations outside of the presence of counsel?
A. No.
Q. Do you have any view about the propriety of taking a national model as you've done and then inputting that into a county-specific model as Professor Cutler has done?

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A. Yes. I believe the national model is appropriate. Again, because marketing strategy is a national phenomenon, the national data are a reliable way to ascertain the relationship between marketing and sales.
I have used the same methodology, for example, in the Neurontin matter concerning Kaiser. We used a national model to estimate the relationship between marketing and sales and applied that to a single healthcare system.
Q. So if marketing is, in your view, nationally done and substantially similar, why is there a difference in shipments on a county level the way Professor Cutler's modeled it?
MR. SOBOL: Objection, scope.
A. This of course is the subject of Professor Cutler's report, and I -- I'm not sure as I sit here I could tell you exactly the factors, but it is obviously counties are situated differently in ways that he captures in his cross-sectional model of harms that could absolutely affect the

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shipments in that county, conditional on marketing.
BY MR. ROTH:
Q. Put another way, though, you would not expect differences in shipments across counties to be caused by marketing where you presume all marketing is national in scope?
MR. SOBOL: Objection.
A. I don't believe that that's the right way of looking at it. So if there's a specific relationship between marketing and sales and -- it could well be that counties start at different levels of use, and so the incremental effect of those relationships, as you see in Professor Cutler's analysis, materializes differently in those counties.
That doesn't mean the effect of marketing was different. It's just the baseline was different.
BY MR. ROTH:
Q. But I think you said that's an issue you would defer to Professor Cutler. You don't have an opinion on how your national model plugs into his county model

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and why the differences may occur in shipments?
MR. SOBOL: Objection.
A. It's my opinion that it's appropriate to take my national estimates. National-level analysis is the most robust analysis. It's the place where the data are really reliable. I think it's appropriate for Professor Cutler to use those estimates in the way that he has.
BY MR. ROTH:
Q. But you have no opinion that explains why we may be seeing variation between county-level shipments in his model despite him using your national model on marketing?
MR. SOBOL: Objection, asked and answered.
A. I do not have an opinion specifically on that, no.
BY MR. ROTH:
Q. You do not attempt to link any specific prescription to any specific defendant's marketing; is that fair?
A. Are you asking me whether I'm

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looking prescription by prescription, these ones were caused and those ones were not? The analysis -- the but-for analysis is a world that did not occur, of course. Would you agree?

The but-for world where the marketing didn't happen, didn't happen. So my analysis can tell me about the correct aggregate amount. It does not identify one prescription at a time.

Q. Okay. Yeah. Just so the record is clear, we've been through this, but you did an aggregate model. You didn't build it from the ground up on a prescription-by-prescription, detail-by-detail basis?

MR. SOBOL: Objection.

A. Right. If I may, the -- I did an aggregate model. The aggregate sales of course are the sum of individual prescriptions, but I am looking at the national level at total marketing on total sales.

It's not that it's unknowable what those prescriptions were underneath the

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sales data. That's not the -- that's not the challenge. The challenge is a conceptual one.

The but-for scenario didn't happen, so I cannot say precisely which prescriptions would not have been written, only that there is some group of them.

BY MR. ROTH:

Q. I know you said earlier you looked for manufacturer-specific detailing notes and marketing information. Did you find or learn of any manufacturer-produced data on detailing to specific doctors within Summit or Cuyahoga County?

A. I don't recall.

Q. And it's fair to say if that does exist, it's not something you reviewed or relied on for Attachment B?

MR. SOBOL: Objection.

A. I did not use individual physician-level data, no.

BY MR. ROTH:

Q. And individual physician-level data, as you may have used in other cases, would be drug specific and doctor specific,

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correct?

MR. SOBOL: Objection.

A. Well, it depends on really what you're talking about. When I have had individual physician-level data in the past, they are sales data. So again, I think the challenge is not disaggregating the sales data.

There are products that exist; sometimes they require subpoenas to get them, but there are products that exist that allow us to look at prescribing at a physician level, but not at detailing at a physician level. So those data I have not used because I have not seen them.

Q. Well, but, for example, an individual manufacturer may keep detailed call notes of the doctor visits that their sales representatives engage in, correct?

A. Well, I have seen call notes in the past, and I have always found them to be unusable.

Q. And why is that, out of curiosity?

A. They often do not include

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provider identifiers, so they can't be linked to other data. They are incomplete, and they -- they are often produced -- so incomplete in the sense of the call notes have a lot of blank fields, and they're often produced for short time periods.

Q. But you didn't look at any individual manufacturer call notes in this case in conjunction with your expert report or opinions?

A. I looked to see if there was a source of complete data for -- in order to do such an analysis, and my staff worked with counsel to identify documents or databases and did not find any.

Q. Pivoting back to Professor Cutler for one more second. Have you worked as an expert in other cases where you've only modeled causation and then another expert has taken that forward and put into it a damages model as Professor Cutler has done here?

A. Yes.

Q. And what case was that or cases, if there's more than one?

A. Yes. In Neurontin, I did the

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for unlawfulness to determine what the impact is?

MR. SOBOL: Objection.

A. I would not conclude that without giving some thought. I'm sure it couldn't be done for every qualitative example that you could come up with, but I think that there are ways of doing it qualitatively, as I, again, did in the Neurontin matter, looking at promotion to psychiatrists as opposed to other physicians.

BY MR. ROTH:

Q. But since you have an aggregate national model with aggregate detailing, is there a way to go, for example, and figure out where the details only to dentists were if the court concludes that that was the unlawful activity as opposed to detailing writ large?

A. I'm not a hundred percent sure about dentists, but as I used in the Neurontin matter, there are detailing data available that would allow you to look nationally by specialty.

Q. But the detailing data you used

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in the Neurontin matter for that exercise is not the same detailing data you used in this matter for your direct model, correct?

A. It's not exactly the same because it was disaggregated by specialty, but I believe those -- that is possible to disaggregate by specialty. I've not done that here.

Q. And you haven't even tested whether it can be done yet, right?

MR. SOBOL: Objection.

A. I have not.

BY MR. ROTH:

Q. I'll give you a quantitative measure. What if the court concludes that any detail over five minutes in length were presumed unlawful, but anything shorter than that isn't? How can you quantify the impact of the over-five-minute visits in your model?

A. As I sit here, I don't know because I haven't thought about it. Clearly I would need some data on the length of details.

Q. We'll come back to this, I promise, but back to paragraph 11 for a

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minute.

So on page 9, the bullet says: Based upon my analyses and assumptions from counsel about the extent of promotion that can be proven to be unlawful, I can reasonably identify approximately [redacted] of MMEs during the period of my analysis as caused by unlawful promotion.

Did I read that correctly?

A. You did.

Q. And the [redacted] is the direct number, and the [redacted] is the indirect number from your models?

A. That's correct.

Q. Okay. And then if you look at paragraph 75 -- and we talked about this earlier already. But paragraph 75, which is on page 50 under Calculation of But-For MMEs.

Do you see that?

A. Yes.

Q. You say: I have been instructed by counsel to assume in my but-for scenarios that the fact finder, judge or jury, finds that all or virtually all promotion by the manufacturer defendants from

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1995 to present was unlawful.

Do you see that?

A. Yes.

Q. And then after the parentheses, it says: Thus, to calculate impact for the purpose of damages beginning in 2006, I modeled a world in which this promotion did not occur, i.e., but-for promotion equals actual promotion for opioids, less all promotion for opioids by the defendants and their surrogates.

Do you see that?

A. I do.

Q. And then in Table 2 on the next page, there's actually a note that says: The percent of MMEs attributable to challenged promotion is calculated as the difference between predicted actual and predicted but-for MMEs, assuming all defendants' promotion is set to zero starting in 1995 divided by predicted actual MMEs.

Do you see that?

A. Yes.

Q. So your model assumption is actually, not virtually, all promotion by

Page 150

defendants is unlawful; it's that all promotion by defendants is unlawful?
A. Yes. I guess the -- sort of the legal formulation of that, I'm repeating there when I say all and virtually all. I'm not sure what virtually all would be quantified as, 99%, but I do all, yes.
Q. Okay. And does that not equate to assuming that all MMEs prescribed due to defendants' promotion were medically unnecessary?
A. No, that does not equate to that.
Q. So in your model, you could have unlawful promotion that leads to medically necessary scripts still?
A. I was asked to quantify the impact of the alleged unlawful promotion, not to examine that question about whether that prescription itself was medically unnecessary, so -- so it's something I haven't looked at and I don't believe it's related to my charge.
The fact that the promotion was unlawful to me does not equate to the fact

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that a prescription was medically unnecessary.
Q. So if promotion, whether lawful or unlawful, results in a medically necessary prescription, how does that prescription cause damage?
MR. SOBOL: Objection, scope.
A. I'm not a lawyer, as you know. And sort of what the theory of liability is and what -- what plaintiffs can recover for and what they can't is -- I do not know.
I have only been asked to examine the extent to which this unlawful conduct caused sales.
BY MR. ROTH:
Q. Okay. You're not a lawyer, but you're a good economist. You've testified a lot about causation and damages, okay, and you're familiar with what a but-for world is, right?
A. Yes.
Q. You have one here?
A. I do.
Q. So how does your but-for world treat medically necessary prescriptions?

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A. Again, this is --
MR. SOBOL: Objection.
But go ahead.
THE WITNESS: Sorry.
A. The model treats the right-hand side variable as the thing that will be proven to be unlawful, and any sales gained from that unlawful conduct as subject to recovery. This I know as a, thank you, good economist and someone who's done that, that downstream of my analysis there's a damage number that plaintiffs I believe will try to recover.
So as an economist, to me, the theory is that any gains, whether or not they resulted in medically necessary prescriptions, are subject to recovery. As an economist, that seems like a reasonable theory if we wanted to deter fraudulent and misleading information. This is the same analysis that I did in the Neurontin case.
BY MR. ROTH:
Q. Stated differently, your model will calculate causation by defendants' marketing even for medically necessary

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prescriptions?
A. It does not distinguish. And to be clear, whether or not there were medically necessary prescriptions caused by the misconduct, I can't say for sure.
Q. And as an economist, is that not something you think you should take into account in your but-for world where you're opining that but for the defendants' conduct, fewer of these MMEs would be out in the world?
A. Absolutely not. Again, as an economist, to me, if the allegations are true, I can see a strong economic rationale for ensuring that liability is attached to all these ill-gotten gains from the alleged misconduct.
Q. But there is a parallel world where a manufacturer may promote lawfully and that lawful promotion would result in medically necessary prescriptions, correct?
MR. SOBOL: Objection.
A. I -- you have a lot of parallel worlds I've noticed, but yes, I think we agreed at the beginning of the day that there

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All right.
So looking at Attachment D, page D6. This may be from one of the same attachments. I don't know. Do you see there's a section that says Comcast Considerations?
A. Yes, I do.
Q. What is the reference to Comcast there?
A. Well, again, I'm not lawyer, but I understand that there was a case involving Comcast, and that the -- what it concerns, again, from a layperson's understanding, is about the ability of the damages as presented to the court to conform to different conclusions about the but-for scenario.
Q. Essentially the issue we've been talking about for the last --
A. The issue we've been talking about.
Q. And why were you concerned about the application of Comcast to this case?
MR. SOBOL: Objection, assumes

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a fact not in evidence.
BY MR. ROTH:
Q. Assuming you were.
A. As you recall, the last part of my assignment was to report on how my conclusion would be different if there were different considerations with regard to who's in, who's out by defendant, for example. So yes.
Q. Okay. I'm trying to streamline here because we've covered more ground --
A. We're going to cover 14 hours no matter what --
Q. That's true.
A. -- so streamlining may be good for you, but it's not good for me.
MR. ROTH: I'm having fun. I think you are too.
THE WITNESS: Of course.
MR. LONERGAN: What about us?
BY MR. ROTH:
Q. Do you agree that your model does not measure the impact -- we went over this. I'm not going to ask that again. Strike that.

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Could you have modeled an individual manufacturer separately?
MR. SOBOL: Objection, asked and answered.
A. It was not something I attempted to do. I think mechanically it is possible. But as I noted, one of the reasons for using an aggregate time series is that we smooth over a lot of noise in the data, so I don't know whether an individual manufacturer-level model would be feasible.
BY MR. ROTH:
Q. Okay. In a but-for world, where all of the unlawful detailing, which is your assumed all defendants' detailing, were replaced with lawful detailing, would there be any change in overall prescribing?
A. Sorry. I just -- so the model doesn't itself have a presumption about lawful and unlawful. The but-for scenario is where that presumption is incorporated, so the model is the model.
Q. I asked a bad question and you properly called me on it. Let me ask a better question.

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If we assume that all unlawful detailing is lawful, then the actual prescribing and the but-for prescribing in your models would be equal to each other?
A. Yes, that's correct. Those two predicted values would be identical.
Q. So the percent of MMEs attributed to unlawful detailing in that scenario would be zero percent.
A. Yes. If marketing were the same in both scenarios, then there would be no difference.
Q. Assume for a minute that a manufacturer's detailing is found to be unlawful but it did not engage in any of the other marketing misconduct alleged by plaintiffs with respect to the key opinion leaders, journal advertising and the other factors.
How would your model account for harm for that specific manufacturer?
MR. SOBOL: Objection.
A. In my opinion, that would be a legal question because, again, all the manufacturers are operating in the same

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ecosystem. According to the complaint and everything I know as a health economist, the effects of one manufacturer's unbranded marketing -- I use that to refer to the guidelines and those kinds of activities -- will spill over on to another manufacturer, and I don't know whether it would be appropriate to pull that out or not.
BY MR. ROTH:
Q. That's a long answer. I want to -- I think I asked a more specific question.
A. Sure.
Q. So if detailing is unlawful --
A. Yes.
Q. -- and let's say also the other stuff, okay, key opinion leaders influencing standards of care is also unlawful, and a manufacturer just detailed, they're going to have the same percentage of liability in your direct model whether or not they engaged in the other unlawful conduct, correct?
MR. SOBOL: Objection.
A. Yes, that's true. Although it's true in terms of what I calculate in

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Table 3. Just to be clear, I don't have an opinion on liability. That's a legal matter. But what I do in Table 3 is I say, okay, well, what would happen if we said the detailing by Purdue were lawful, what would happen there?
So whether or not that quantum is exactly what liability is, I don't -- I don't really know how the court is going to see that, and so that's why I don't really know if you would need to say, well, some of why your detailing was so productive was caused by somebody else's activity. I don't know whether it would make sense to back that out.
BY MR. ROTH:
Q. So let's take the opposite.
A. Yeah.
Q. Someone's detailing is entirely lawful. There's no issue there. But they've influenced the standards of care through key opinion leaders, they've paid off doctors, they've done all of the parade of horribles that the plaintiffs allege, and the court finds that that in fact is unlawful. In your

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model, that manufacturer has no liability, correct?
MR. SOBOL: Objection.
A. Well, again, my model is looking at the aggregate causation between marketing and sales; it is not designed to assign liability to individual manufacturers nor, again, am I certain how counsel or the courts would do so.
The purpose of Table 3 is to show that I can back out individual levels of detailing, not to assign liability. So I -- I don't know exactly how that would proceed, even -- even without having these variable assumptions across defendants. I have not looked defendant by defendant at something like liability.
BY MR. ROTH:
Q. Okay. So let's look aggregate.
If for all the manufacturers the conclusion is that the detailing is entirely lawful, but the manufacturers engaged in other conduct that the court finds is unlawful, what would the result of your model be in that world?

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MR. SOBOL: Objection.
A. I would have to give it some thought, but again, my preferred model ultimately captures the effect of all that other stuff that we're calling as really is the what happens -- in part, a chunk of it is what happens to the promotional effectiveness after the first turning point and before the second turning point. And so in theory, one could look at that, but it would really depend on the specific set of facts.
BY MR. ROTH:
Q. It would require a new model probably?
MR. SOBOL: Objection.
A. I don't know that it would require a new model. It would require a new but-for analysis.
BY MR. ROTH:
Q. Back to your body of your report, paragraph 64. You say: The econometric analyses serve two purposes. First, they indicate that in economic terms there is a causal relationship between the defendants' promotion and prescriptions of

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of promotion are correlated?
A. Well, as I mentioned, when I looked at the IQVIA data for journal advertisements, direct-to-consumer advertising, sampling, there was very little data there. I have no reason to believe that they're just not measuring it. It may be that there are some kinds of advertising that we see in the marketing budgets that IQVIA doesn't capture. But to the extent that the IQVIA data are complete, it was not really possible to do a correlation analysis because there was so little data for these other tools.
Q. So when you say it's a reasonable expectation that other forms of marketing follow detailing, that's really just an assumption based on your experience with other drugs in other cases?
A. It's based on my experience with very similar kinds of analyses with other drugs. And again, I cite to Dr. Perri's report at the beginning of this where he talks about the coordination of marketing mechanisms, so it's very consistent

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with his opinions as well.
Q. Yeah. But to be clear, that's an assumption you're making that's not supported by any specific work you've done to confirm it's true that detailing and other forms of promotion are correlated for opioids?
MR. SOBOL: Objection, asked and answered.
A. Again, the analysis -- the correlation analysis was not possible here, so I'm relying on my past experience and Dr. Perri's expertise.
BY MR. ROTH:
Q. Okay. Then you say: Third, alternative measures of promotion that I could obtain from available sources have substantial missing data, e.g., estimates of payments to pain advocacy groups can only be obtained from the records of some, but not all manufacturers.
Do you see that?
A. Yes.
Q. And that's what we've been talking about.

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A. Yes.
Q. Are you certain that every manufacturer in this case has made payments to pain advocacy groups for opioids?
A. Well, given -- that's -- it's hard to be certain about something for which I have incomplete data, so I -- there are a number of documents that I cite to that show these kinds of payments, and I believe other experts have tracked these payments as well.
But am I certain that every defendant has evidence of that type? No, I'm not certain.
Q. And then you wrap up this paragraph saying: Note that in this case there appears to be substantial evidence that through means other than promotional spending, the defendant manufacturers fundamentally changed opioid prescribing standards. The direct approach does not calculate the efforts -- the effects, sorry -- of the nonpromotional marketing and is thus conservative.
Do you see that?
A. Yes.

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Q. But that's not universally true for all manufacturers, is it?
MR. SOBOL: Objection.
A. Again, my opinions here really are to look at the market as a whole, and even if there were a defendant that did not incur this kind of spending, the effects of changing things like guidelines would -- would flow through to everyone's drugs, right.
So these are sort of broad changes in the environment of prescribing, and so again, I don't have an opinion on the liability question of whether there's a defendant who has not undertaken the unbranded advertising, whether they therefore should not be liable for its effects. I don't know the answer to that.
BY MR. ROTH:
Q. What if a manufacturer engages only in limited detailing and not other types of promotional activities? It would not be conservative for that manufacturer to only look at detailing, correct?
A. The purpose of my analysis is

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not to assign liability to individual defendants. It's to look at the aggregate effect. So I don't know what would be appropriate. That to me seems like a legal question.

Q. Would it be conservative from an economic perspective if a manufacturer purchases an opioid product in, say, 2008 and engages in detailing but no other marketing?

A. I do not calculate any estimates at the individual defendant level, so I cannot characterize them as conservative or otherwise. I'm only looking at aggregate effects.

Q. Okay. I'm just trying to get at what you mean when you say the direct approach is conservative. It strikes me that for a defendant who didn't participate in the market ecosystem until late in the game and only detailed, it's actually the opposite of conservative the way your model calculates damages.

MR. SOBOL: Objection.

A. I believe that is inaccurate. My model does not calculate damages for any

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individual defendant, period.

BY MR. ROTH:

Q. Causation, sorry, I should have said.

A. So again, because I am not looking at impact for an individual defendant, we cannot characterize my analysis as conservative or otherwise for an individual defendant. It is for the market as a whole.

Q. Okay. So when you say in paragraph 56 that the approach is conservative, you mean on an aggregate basis it is conservative because it looks at detailing and not other things?

A. That's correct.

Q. Okay. Sort of implicit in that statement and other things you've said today is an assumption that all manufacturers market opioids the same way.

MR. SOBOL: Objection.

BY MR. ROTH:

Q. Do you agree with that?

A. I don't believe so. Again, I include in my model detailing. To the extent

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that there's variation in the way manufacturers detail, the specific details may generate more prescriptions or fewer, and my model captures the average effect. That's what the coefficients basically tell us is the average effects.

So there may be variation in there, but for the purposes of calculating aggregate impact, the average is appropriate.

Q. So for manufacturers who have detailing that's below average, they're being brought up to the average by the way you've aggregated the model in terms of causation?

A. Well, by definition, an average will be not the same as all the individual components unless there's no variation, and so there will be some who are brought up and some who are brought down.

It's my belief, as we talked about before, that this aggregate model is the most reliable model; because there's substantial spillover effects, because there can be noise in the data when we try to disaggregate it too much. I think for that reason, the aggregate model is preferable.

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Q. You know, though, that not every manufacturer markets products the same way?

A. I guess -- I'm not exactly sure how to answer that question. As we've talked about before, I am not a pharmaceutical marketing expert. I leave that to Dr. Perri. I think it's reasonable to assume that there is some variation in tactics and the like across manufacturers and perhaps across products.

Q. Well, let's look at one thing you do talk about. So there's a difference in the way promotion is engaged in by brand companies and marketing may be engaged in by generic companies, correct?

A. Yes, brand companies are primarily the ones that engage in marketing.

Q. A generic company might still detail but may just talk about price and formulary status?

MR. SOBOL: Objection.

A. Generally, manufacturers will not detail physicians for generics. They may have other sales force activities that they

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MR. SOBOL: Objection.

A. Generally, manufacturers will not detail physicians for generics. They may have other sales force activities that they

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do that relate to price, but individual physicians are not generally making a decision about one generic versus the other. That decision happens at the pharmacy.
BY MR. ROTH:
Q. But Attachment C contains a slew of generics on that list?
A. That's correct. Some of them have contacts related to them. Some of them don't. Some of those contacts relate to marketing agreements that are really for brand drugs.
Q. So how do you square your testimony a minute ago that generics generally don't detail with the fact that you have a lot of promotional contacts in your model for generic drugs?
MR. SOBOL: Objection.
A. I believe I just squared it. I think a lot of those contacts relate to marketing agreements.
BY MR. ROTH:
Q. And so if there's marketing under a marketing agreement, that gets attributed to the generic drug, even though

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it may be different in kind than a branded drug promotional visit?
MR. SOBOL: Objection.
A. No. The marketing of a particular drug is identified, and if the drug is sold by a defendant manufacturer, even if it's detailed by a different manufacturer, that gets counted in my model. And then in Table 3, I take out those marketing agreement related drugs.
So -- so it's -- the marketing is associated with -- I mean, I look at aggregate marketing, so it's all in the aggregate marketing. But I do have a mechanism for pulling out marketing that's for someone else's drug.
BY MR. ROTH:
Q. So if that's the mechanism you're using, how are any of these detailing contacts being attributed to generic drugs in your model?
MR. SOBOL: Objection.
A. I think you misunderstand the nature of the model. The model uses aggregate MMEs and aggregate detailing, so

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there's not an attribution underneath that.
And furthermore, as we know, that detailing for the brand drug will spill over to the generic drugs too, and so it's entirely appropriate that the model allows that to happen.
Q. So maybe we're talking past each other.
I understand the model works that way.
A. Yeah.
Q. What I'm talking about, which we'll get to later, is your Table 3 allocates drugs to specific manufacturers, including generic manufacturers, and I'm just trying to understand how that works in a world where we agree that generic drugs generally aren't detailed.
A. So Table 3, it sits on top of a somewhat more complicated analysis, but what it in effect does is it takes the detailing associated with each of those defendants and treats it separately, depending on where we are in the table.
So, you know, at the top for

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Actavis, to the extent that Actavis has detailing in my data, the row that says, well, what would the damages look like or what would impact look like if Actavis' detailing was deemed to be lawful? Basically we've taken out their detailing, out of -- we've left it in basically in a but-for world. It happens because it's lawful.
So that's how -- that's how the allocation works, is in Table 3, it's by manufacturer.
Q. Okay. We'll get there.
A. Okay.
Q. But that's helpful.
If you look back at paragraph 55, I mean, you acknowledge that detailing is undertaken by the brand name drugs in the class, typically peaks during initial launch, and ceases shortly before or after the AB-rated bioequivalent generic drugs enter.
A. That's correct.
Q. And how does your model account for detailing at different points of a product's life cycle, close-to-launch

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detailing versus the period right before generic entry?
A. My model is an aggregate model, so I'm looking across drugs in the entire market, and those drugs are at different stages in their life cycle. And so the important input to my model is the level of detailing, not where it is in the course of a product's life cycle.
But we know that the bolus of detailing happens for these new products, and so that is incorporated into the data.
Q. So it's incorporated in the sense that you'll see more contact at the beginning of the life cycle than at the end of the life cycle?
A. That's correct.
Q. But the detailing that happens at the beginning of the life cycle could be qualitatively different than the detailing that happens at the end of the branded life cycle.
Would you agree with that?
MR. SOBOL: Objection.
A. I don't know that to be true.

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BY MR. ROTH:
Q. As an economist, I mean, when a product is launched, you would expect more detailing about clinical studies and things designed to promote a new product that physicians might be unaware of, right?
A. It may be that there is more of that sort of baseline information at the beginning.
Q. Right. And at the end of a product's life cycle, when the generics are about to come on the market, you might expect the detailing to focus more on things like price and availability and formulary status and things of that nature, right?
A. I have seen no detailing information that pertains to price. I can't say that it never happens, but I've certainly never seen that.
What that sort of -- what you've just described here is on the one hand saying, hey, there's this new drug early on, and don't forgot your old friend at the end, something to that effect. Those -- those differences are not relevant to the question

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of does the detail generate more MMEs.
So for my purposes, I really only want to understand does the detail generate more MMEs. And again, because I'm looking at the aggregate, the fact that some drugs are ending and others are beginning, that -- that sort of -- that mix, it may change a little bit over time, but I'll be looking across a set of drugs at different stages.
Q. Okay. But what I described might be relevant to the question of whether the detailing was lawful, correct?
A. I don't know what you mean by that.
Q. Right. So we've established this, I think, but just to try it one more time: Because your model is just focusing on whether detailing impacts the aggregate number of MMEs, you don't evaluate any qualitative difference in the kind of detailing that is occurring?
MR. SOBOL: Objection, asked and answered.
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BY MR. ROTH:
Q. Is that a fair statement?
MR. SOBOL: Asked and answered.
A. I -- you had a "because" at the beginning of that sentence, which doesn't make sense to me. I am not looking at the content of the detailing as we talked about this morning. I am assuming the plaintiffs will prove their case.
I understand that you think differently and you're trying to probe whether I've tried to disaggregate the detailing.
I have not tried to disaggregate the detailing by drug or over time. It is possible to do that, but I have not done that.
BY MR. ROTH:
Q. So in your direct model, just like all MMEs are created equal, all detailing contacts are created equal?
MR. SOBOL: Objection.
A. Again, I would acknowledge that there's variation in detailing and that my model captures the average effect.

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BY MR. ROTH:
Q. And it captures the average effect by treating each contact the same?
MR. SOBOL: Objection.
A. Well, I guess sort of an average effect means that sort of tautologically, I'm summing up all of the effects.
BY MR. ROTH:
Q. Does your model account for rivalrous marketing?
A. I'm so happy that we've gotten back to this.
MR. SOBOL: That makes one of us.
A. The aggregate model that I put forth is intended to essentially obscure the rivalrous marketing, so to the extent that marketing only moves people from hydrocodone to oxycodone or the other direction, whatever it is, that will show up as a noneffect in my model.
So I'm only looking at market expansion because the question I care about is market expansion.

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BY MR. ROTH:
Q. I'm not sure I followed your answer. So how does it show up as a noneffect if you're including that contact in your regression analysis, whether it was new drug promotion or rivalrous marketing?
A. I think the way you're looking at rivalrous marketing is a bit different than the way I would look at it. And this goes back to a conversation we had before where I think there was a little bit of a disconnect.
So it may well be that you go to the detail and what you want to talk about is why you're better than the other guy. But still, what happens is you actually increase the use of any product in this class.
So what I'm concerned about is not the intent of the marketing but the effect of the marketing. You seem focused on the intent.
Q. I do. But now I think you've helped me, and your answer is actually the opposite of what I understood it to be before.

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When you say that rivalrous marketing is a noneffect, what you mean is you don't assess whether the marketing was rivalrous or not, because in either case, your view is it will potentially lead to increased MMEs, so it gets counted?
MR. SOBOL: Objection, form, asked and answered.
A. I am interested only in a particular kind of impact, and that impact is an increase in the number of MMEs. If there is marketing that changes the drug people take without affecting their MMEs, then I ignore that.
Let's just say there's unlawful conduct and you earn money off of it, but it's really only because you've switched brands. That, I'm not counting, so that's a kind of rivalrous marketing effect that's not being counted in my impact assessment.
I'm only concerned about market expansion by definition. Economists can be interested in both of those things, but for my purpose, I'm only interested in market expansion.

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BY MR. ROTH:
Q. I'm just trying to understand functionally how that happens.
So the reason you're saying that is because you're only looking at the delta, the change in MMEs, and so if there's no change, then the rivalrous marketing doesn't get counted? I'm just struggling with the mechanics.
A. Sure. Let me try to explain.
If we had two drugs in the market and we looked at their marketing separately, we could ascertain whether your marketing increases your sales, right, and -- and then what we wouldn't know is, is that increase coming from new patients, or is it coming from the decrease in someone else's sales. So we could use a system kind of analysis to show what's happening.
So people have done this in prescription drugs. I know you've spent some time with the literature, and they're curious about when you increase your sales, does it come at someone else's expense or are you just growing the market. And in different

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drug classes, those two things seem to operate differently.

But if you were to add those two drugs together and say, okay, for any herpes treatment, what's the total effect of marketing? Then what you would get is only the market expansion effect. You would wash out any of the market stealing because your gain is my loss. And so those two things would net out and you'd only get the net result. So that's what I'm doing here.

Q. So the mechanics are because it's an aggregate model that's aggregating all contacts and aggregating all scripts, it comes out in the wash if it's rivalrous?

A. Exactly. Rivalrous, again, my definition of rivalrous is my sales come from you and that those two things fully offset.

Q. Okay. But the detail itself is still counted in the model, because you're not actually looking substantively at the detail to determine what happened?

MR. SOBOL: Objection.

A. That is correct. The detail is still in the model, and where the rivalrous

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piece shows up is that it dampens the effectiveness of marketing that we measure.

BY MR. ROTH:

Q. Okay. We're finally on the same page then.

How does your model account for unbranded marketing?

A. Well, in two ways. In Model C, I explicitly put in some of those events. We can look at exactly which ones they are.

Q. I was saving this for later, but we can --

A. I know, it sounds like an after-lunch conversation, but the consensus statement from the American Academy of Pain Management and the American Pain Society, the Federation of State Medical Boards Guidelines, the JCAHO pain standards released.

So these, I understand that plaintiffs intend to prove they were manipulated by the defendants. So I put those explicitly in Model C.

And then as I describe Model B and my rationale and the way I interpret the

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turning points is that they -- that is incorporating these many different events and tactics.

Q. So the unbranded marketing is captured by the way you do the breaks and the way you test for these five events in Model C, correct?

A. That's correct.

Q. But the unbranded marketing is not captured in the detailing contacts you use for your stock of promotion?

A. That's correct.

Q. How does your model account for the peer-to-peer marketing that I think you or Dr. Perri describes as a contagion phenomenon in paragraph 25?

A. Yeah. So that phenomenon will get picked up in marketing effectiveness, because again, we're looking at aggregate prescribing and not just the prescribing of the targeted physicians.

So, you know, as -- we can go back to our favorite paper by Datta and Dave, they're looking at individual physicians.

It could well be, of course,

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detailing physician A causes physician B's prescribing to increase; they're not really looking at that because they're only looking within physician. But we, for the same reasons that I can capture market expansion appropriately, aggregating up across doctors here allows me to capture that contagion effect.

Q. We do agree, though, that at an individual prescriber, individual detail visit level, there could be variation in the impact that visit has?

A. There may be variation in the impact of detailing on an individual prescriber and her network and my model will average that, will generate a result that captures the average.

Q. And we talked a little bit earlier about some of the variability in the way detailing occurs. I think I used the pizza example.

Do you remember that?

A. I remember pizza.

Q. Okay. I want to come back to that for a minute maybe because it's

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detailing versus the period right before generic entry?
A. My model is an aggregate model, so I'm looking across drugs in the entire market, and those drugs are at different stages in their life cycle. And so the important input to my model is the level of detailing, not where it is in the course of a product's life cycle.
But we know that the bolus of detailing happens for these new products, and so that is incorporated into the data.
Q. So it's incorporated in the sense that you'll see more contact at the beginning of the life cycle than at the end of the life cycle?
A. That's correct.
Q. But the detailing that happens at the beginning of the life cycle could be qualitatively different than the detailing that happens at the end of the branded life cycle.
Would you agree with that?
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Q. As an economist, I mean, when a product is launched, you would expect more detailing about clinical studies and things designed to promote a new product that physicians might be unaware of, right?
A. It may be that there is more of that sort of baseline information at the beginning.
Q. Right. And at the end of a product's life cycle, when the generics are about to come on the market, you might expect the detailing to focus more on things like price and availability and formulary status and things of that nature, right?
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page 452 again, we're now going to get to talk about endogeneity.
A. Excellent.
Q. You knew it was coming.
A. I did.
Q. So at the top of the page, they say: A key empirical concern in this literature relates to potential targeting bias, which physicians who already have a history of prescribing a particular drug or who have a higher unobserved likelihood of prescribing the drug (for instance, due to their patient population or practice type) more likely to be targeted by detailers.
Do you see that?
A. I do.
Q. And is that an empirical concern that you as an econometrician or economist would have?
A. If I were doing a physician-level study, yes.
Q. And one could describe this issue as something called endogeneity?
A. Yes.
Q. And can you define endogeneity

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for us?
A. Well, in effect, what they're talking about here, I described earlier this morning the endogeneity they're concerned about is of the type that physicians who are more likely to be detailed are already more likely to be open to prescribing or are, in fact, high prescribers already.
Q. And it's called endogeneity because that's an endogenous problem?
A. Yes. The level of detailing is endogenously determined with the level of prescribing.
Q. So continuing on their paper, they say "Addressing such endogeneity is a vital issue in identifying plausibly causal effects of advertising, which would otherwise lead to overestimates of the advertising response.
Do you see that?
A. I do see that.
Q. And --
A. And as I said before, it's because they're talking about physician-level data.

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Q. Which you didn't look at?
MR. SOBOL: Objection, asked and answered.
A. It was not relevant to my report because I have been asked to conduct an aggregate analysis.
BY MR. ROTH:
Q. And then they say: Studies that address this endogeneity in most cases have done so through an instrumental variables-based methodology, although as Bronnenberg caution, many of the instruments employed have limited variation and may not fully satisfy the validity requirements. This caveat notwithstanding, these studies generally find a smaller marginal effect of detailing relative to those that do not account for endogeneity.
Do you see that?
A. I do.
Q. Now, what about having an aggregate macro analysis means that endogeneity is no issue for you?
MR. SOBOL: Objection.
A. Well, endogeneity is something

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different in every context, so what they're describing specifically here, I mean, I think they say that they're talking about targeting bias, so that's the physician-level concern.
It simply doesn't exist in my data because I'm not looking at physician-level data. I cannot mistake the fact that Doctor A has high prescriptions compared to Doctor B, not because she's been detailed before, but she's been detailed before because she has high prescriptions. Because I'm only looking at the aggregate. So the only kind of endogeneity there, it can't be related to targeting. It has to be related to something else.
In other instances people have looked at endogeneity when it comes to a specific product. They said, well, you know, we knew that this product was going to be a blockbuster so we put our detailing on product A versus product B, and so that's the nature of the endogeneity. But again, I don't have that here because I'm aggregating across products.
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promotion with a depreciation rate similar to here?
A. At least I'm consistent, yes.
Q. No doubt.
And then you also used a Fisher Ideal Price Index in that case too?
A. I did.
Q. But you weren't consistent next, because then you say: In addition, the estimation deals with two important issues, serial correlation in the error terms and the endogeneity of price and promotion. Serial correlation in the error terms require the use of time series methods to produce reliable estimates. The endogeneity of price and promotion was handled using the standard instrumental variables approach.
Did I read that correctly?
A. Yes, you did.
Q. And if endogeneity is an issue for you -- I understand you don't think it is -- but if it is an issue for you, your regression may lead to overestimating the response to promotion?
MR. SOBOL: Well, then,

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objection.
A. I do not believe endogeneity is an issue in my model for the reasons that I've described. But in particular, what we're looking at is an aggregate phenomenon, and so the theory of endogeneity that we would have to have requires this reverse causation on a month-by-month basis for the market as a whole, and I do not believe that's a plausible notion.
BY MR. ROTH:
Q. Okay. Don't fight the hypothetical, though.
Assume endogeneity is an issue with your model. What impact would it have?
MR. SOBOL: Objection, asked and answered.
A. I cannot imagine a form of endogeneity that would make sense in this case. I cannot understand how it could be that one month's sales could have caused the next month's detailing to change in the way that endogeneity requires. It's simply not a plausible set of ideas in this context.
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BY MR. ROTH:
Q. And why is that again?
A. Because we're looking at the market as a whole, and not individual manufacturers or individual drugs, where those decisions are made.
Q. I guess I'm confused, because earlier you talked about us as this manufacturing ecosystem that all kind of acts together, but now for purposes of endogeneity, you're saying there are no issues because we're not looking at it on an individualized basis, and I can't square those two things. Maybe you can help.
A. Sure.
MR. SOBOL: I'll object to the form, but go for it.
A. Sure. I think where you're confused is the ecosystem is causing prescribing in a way that may be concerted, but I -- I don't believe anywhere I have said that the defendants are aligning, explicitly, their marketing efforts.
BY MR. ROTH:
Q. Okay. Do you remember if you

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used an instrumental variables approach to address endogeneity in Neurontin?
A. All not quite 12 years ago, 17, however many, but I believe the answer is yes, in the circumstance of -- thank you, can you remind me -- the circumstance is very similar to the Zyprexa matter.
Q. Yes, so we can do this one quickly.
A. Yes.
Q. But Exhibit 13 is your Neurontin declaration, excerpted.
(Whereupon, Deposition Exhibit Rosenthal-13, Rosenthal Declaration re: Neurontin, was marked for identification.)
A. It's in Calibri too.
BY MR. ROTH:
Q. It must be the Greylock computers. Did Greylock McKinnon assist you there?
A. Yes.
Q. August 2008.
So looking at your Neurontin declaration, you were addressing alleged

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the analysis of competition at the individual product level within each class we specify and estimate three alternative models: 1, an AIDS-type specification; 2, a logit model with log of quantity share divided by, one minus quantity share, on the left-hand side, and prices and promotional spending on the right-hand side; and 3, a Cobb-Douglas model in log levels.

Do you see that?

A. Yes, I do.

Q. And then on page 15, under Econometric Results, it says: We begin by presenting results in Table 3 for the top of the tree structure in Figure 2, the class level quantity equations.

Do you see that?

A. I do.

Q. And then if you look at Table 3, which is on page 25, the top two lines say: Class DTC and Class Detail, and they have an asterisk that says Endogenous, IV Estimated.

Do you see that?

A. Yes, I do. Actually, I can

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keep reading, but I think essentially the class level estimates are the sum of the individual product level estimates. So again, the instrumentation was at a product level.

Q. And then applied to the class level through aggregation?

A. That's right.

Q. Okay. And if you had disaggregated individual drugs or manufacturers in this case, you could have applied an instrumental variables method to each and aggregated them similarly here?

MR. SOBOL: This case, the opioids case, not this?

MR. ROTH: Correct, so let me reask it.

MR. SOBOL: Yeah.

BY MR. ROTH:

Q. If you had used disaggregated individual drugs or manufacturers in the opioids case we're talking about now, you could have applied an instrumental variables model to each individual drug and then aggregated them as you did in this article?

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A. Unlike the research question in this paper, my assignment asks me to compute the impact of the alleged misconduct at the level of the class, the industry, opioid industry as a whole. And so it was not appropriate for me to look at individual drug level analyses.

I maintain that at that class level, industry level, these endogeneity questions do not pertain.

Q. Did you test that hypothesis by looking at an individual defendant or two to see how the issues there compare to how your model handles endogeneity?

A. Since my assignment was an aggregate assignment, I have conducted my analysis at the aggregate level. I have not conducted my analysis at the level of an individual defendant.

Q. And, in fact, to confirm, you've not reviewed any individual defendant's marketing materials for any drug at issue in this case?

MR. SOBOL: Objection, asked and answered.

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A. I'm not sure what you mean by that exactly. I reviewed the documents that you see I relied on in my report. I would consider those to be marketing materials.

BY MR. ROTH:

Q. You've not reviewed any manufacturer's marketing plan for any drug at issue in this case?

MR. SOBOL: Objection.

A. Again, I'm not sure that that's entirely correct. I do cite to what I would consider to be marketing plans.

BY MR. ROTH:

Q. Okay. Aside from the documents reflected in Attachment B or cited in your report, you've not reviewed any marketing materials for any drugs at issue in this case?

A. Aside from materials cited in my report, I've certainly not relied on any of those marketing materials.

Q. And aside from the depositions reflected in Attachment B, you've not reviewed any depositions from any manufacturer's sales representatives?